Bicycle and Pedestrian Counts Pilot Project

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THE CITY OF COLUMBUS
MICHAEL B. COLEMAN, MAYOR

alta PLANNING + DESIGN

Acknowledgements

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1 Executive Summary

The City of Columbus recognizes that walking and bicycling for transportation and recreation purposes have economic, health and environmental benefits. In order for residents and visitors to choose to walk or ride a bicycle, these modes must be perceived as safe and convenient. Better data on non-motorized travel will help make informed transportation operations and investment decisions targeting improved walking and bicycling infrastructure.

While much is known about automobile travel from decades of traffic counting, until recently there were no efficient methods of gathering walking and bicycling activity data. Bicycle counts have been limited to manual observation for no more than a few hours per year. The City has undertaken this automatic data collection pilot project to assess the costs and benefits of increasing the duration and number of locations of bicyclist and pedestrian counts.

A sample of 31 bicycle and 18 pedestrian count locations representing various geographic areas and facility types was taken over the summer of 2014. The top seven bicycle count locations sampled all had recorded average daily values of 100 or more. These sites are all in or near downtown. Suburban arterials with less well-connected bicycle networks had lower values, however the data will provide a useful baseline to assess the impact of connectivity and quality improvements. The top seven pedestrian count locations sampled all had recorded average daily values of 300 or more. As with the bicycle counts, these were mostly clustered around downtown, but the highest activity levels were found near Ohio State University.

Better data on non-motorized travel will help make informed transportation operations and investment decisions targeting improved walking and bicycling infrastructure.

The top seven bicycle count locations sampled all had recorded average daily values of 100 or more.

The top seven pedestrian count locations sampled all had recorded average daily values of 300 or more.

Overall, it is recommended that the City continue annual deployments at the same general set of locations in order to estimate the overall change in walking and cycling activity.

It was found that pneumatic tube bicycle counters are applicable on almost any street, but careful siting at each location is required to avoid damage to rubber tubes from the tires of turning motorists. The inductive loop bicycle counters are easy to use but more time consuming and costly to install. Infrared pedestrian counters are straightforward after some practice, but need to be downloaded frequently at high activity level locations. The equipment is durable and nothing was stolen or vandalized during the pilot study.

Overall, it is recommended that the City continue annual deployments at the same general set of locations in order to estimate the overall change in walking and cycling activity. The count equipment can also be used to measure activity levels before and after transportation system or land use changes at specific locations.

2 Introduction

Context

The City of Columbus recognizes that walking and bicycling for transportation and recreation purposes have economic, health and environmental benefits. In 2013, 79% of Columbus residents drove single-occupancy vehicles to work, but the Columbus Green Community Plan aims to reduce this percentage to 70% by 2020. One approach to accomplishing this reduction is to shift more trips to bicycling and walking. In order for residents and visitors to choose to walk or ride a bicycle, these modes must be perceived as safe and convenient.

Purpose

While data on traffic counts and roadway crashes in Columbus is easily obtained, pedestrian and bicycle counts are rarely included. This prevents calculation of the relative exposure rates of these modes as is commonly done for motor vehicles. Better pedestrian and bicycle data will help inform decisions on transportation operations and investment.

In some areas of the City of Columbus, up to 8.5%[1] of residents ride a bicycle to work or school, yet bicycle counts have been limited to manual observation for no more than a few hours per year. The City has undertaken this automatic data collection pilot project to assess the costs and benefits of increasing the duration and number of locations of bicyclist and pedestrian counts. These counts will help:

- Determine existing travel patterns
- Track trends
- Evaluate the effectiveness of infrastructure changes
- Evaluate safety by allowing calculation of exposure rates
- Inform transportation and land use modeling

Project Process

This project has involved the selection of count equipment, identification of 31 bicycle count and 18 pedestrian count locations, a pilot installation of the counters, and data analysis to inform potential future redeployment. Detailed documentation has been produced for equipment installation, data analysis methods, and database management.

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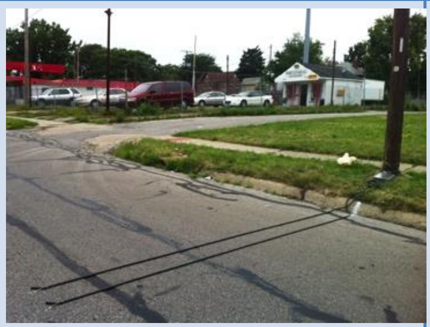
[1] American Community Survey 2012; based on the highest reported census tract in the City of Columbus

3 Pilot Program Design

3.1 Equipment

Many new automatic count technologies have become available in recent years. The equipment selected for this pilot program is summarized in Table 1.

Table 1: Equipment Characteristics

Inductive Loops	*Pneumatic Tubes*	*Active Infrared*
		
• Loops count people bicycling within defined bike lanes up to 5' wide. • Wire loops permanently embedded in the pavement sense change in magnetic field as a bicycle wheel passes over it. • Data was collected from six sites, using two counters.	• Pneumatic tubes count people bicycling anywhere within a lane up to 18' wide. • Detects pressure on tube when bicycle passes over. The logger counts a bicycle if the movement matches a bicycle's speed and weight. • Data was collected at 25 sites, using four counters.	• An infrared beam is sent from the transmitter to the receiver; when a person breaks the beam for more than a set time, a count is registered. Does not differentiate sidewalk bicyclists from pedestrians. • Data was collected at 19 sites, using four counters.

The pilot program equipment cost is summarized in Table 2. All six bicycle counters included an upgrade to 15-minute interval recording capacity, which improves the data resolution when calculating the peak hour. Data transfer via cellular modems can reduce labor costs and provide a live data feed. Modems are standard on all units, but the cellular plan was enabled only on the inductive counters. This capability can be enabled remotely by the supplier on any or all of the four tube counters if the City should choose to do so in future.

Table 2: Pilot Program Equipment Cost Summary

Item	**Cost**
EcoCounter inductive loop counters for bicycles (2)	$6,590
EcoCounter pneumatic tubes for bicycles (4)	$10,420
Trailmaster infrared counters for pedestrians (4)	$2,345
Installation costs including equipment, tools, and labor	$12,165
Automatic data transmission for inductive loops	$840
Total	**$32,360**

3.2 Pilot Project Schedule

The pilot project data collection effort began on July 7, 2014 and continued until October 9, 2014. Figure 1 shows the equipment rotation schedule.

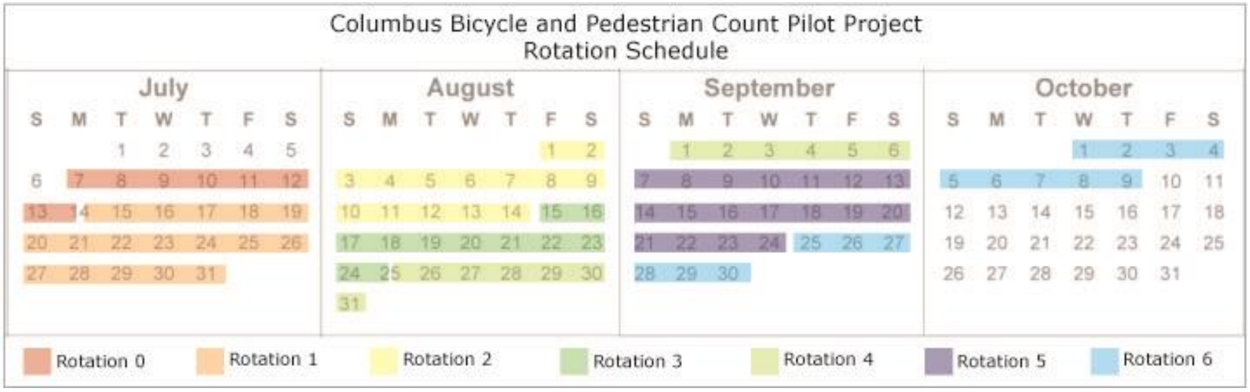


Figure 1. 2014 Count Rotation schedule

Each rotation consisted of deploying four pneumatic tube loggers and four infrared counters. Inductive loop sensors were active throughout the entire period, although the inductive loop counter locations changed once per month, instead of twice per month like the rest of the equipment.

Rotation 0, shown in Figure 1, consisted of deploying MORPC-owned equipment prior to installing all City-owned equipment.

The pilot project covered 31 locations, using 6 counters as discussed in the next section. Utilizing a two-week duration—for pneumatic tubes and infrared sensors—and a month-long duration for inductive loops, enables more extensive geographic coverage than permanent full-time automatic counter deployment. This method lays the framework for a permanent count program. The cost per site-hour of data collected is reduced because of the number of data collecting locations served by each logger.

3.3 Count Locations

Location Selection Criteria

Locations were selected based on the following considerations:

- Geography – count locations represent a variety of geographic areas throughout the city.
- User types – different routes appeal to different types of bicycle users, such as commuters, school children, recreational riders, and sports cyclists.
- City staff input – the consultant team asked City staff for desired count locations, based on upcoming projects and areas of interest.

The equipment type and installation needs differ by various roadway types.

Arterial streets were monitored with various methods:

- Inductive loops were used on streets with bicycle lanes.
- Pneumatic tubes are used on streets with or without bicycle lanes.
- Manual counts help determine how many riders use the sidewalk rather than busy roads

Figure 2. Tubes installed across a hatched no-parking lane and bike lane on West Broad Street

Downtown and other commercial streets serve all mobility, access and activity needs. Tubes are the most flexible automatic count technology for such streets, although careful analysis of the data is required to remove errors arising from vehicles parked on the tubes.

Figure 3. Tubes installed across both lanes in one direction on Nationwide Boulevard. Cones are removed after installation.

Narrow, mixed traffic streets, such as neighborhood streets, generally do not have bike lanes. Therefore, tubes were the most appropriate technology choice. The team took care to choose installation sites out of vehicle turning paths, which can damage the rubber tubes.

Figure 4. Twenty-foot tubes were used all the way across the road (both travel directions) on the Steele Avenue bicycle boulevard.

Shared-use paths can be monitored using nearly any technology. For this project, only three shared-use paths were monitored so as not to duplicate MORPC's concurrent series of trail counts. MORPC is conducting a study to investigate the economic impacts of trails within the Columbus area.

Figure 5. Thin tubes that don't create a trip hazard are used to count bicyclists on paths such as the Scioto Trail.

Count Locations

The 31 (bicycle) and 18 (pedestrian) count locations are shown in Figure 6.

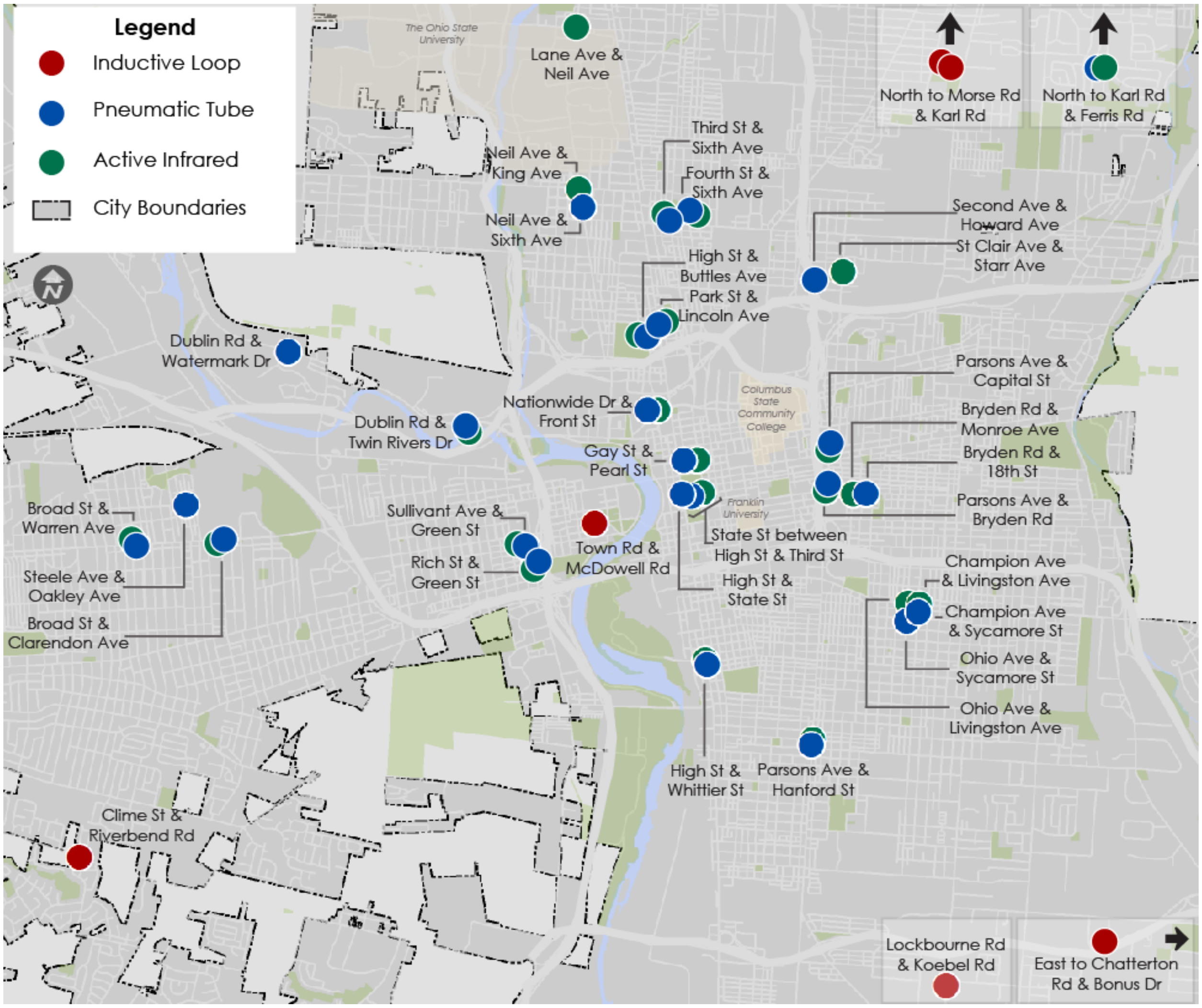


Figure 6: Count Locations Map

4 Results

4.1 Bicycle Count Results

Busiest Locations

As shown in Figure 7, the top seven locations all have recorded values of over 100 bicyclists per day. These sites are all in or near downtown. This graph also shows seven locations with low (<10) average values and/or high variation from day to day (four right most locations on the graph), typically on suburban arterials with less well-connected bicycle networks. Sites with high variability should be counted for longer durations in future counts or monitored closely for possible interference or other external factors.

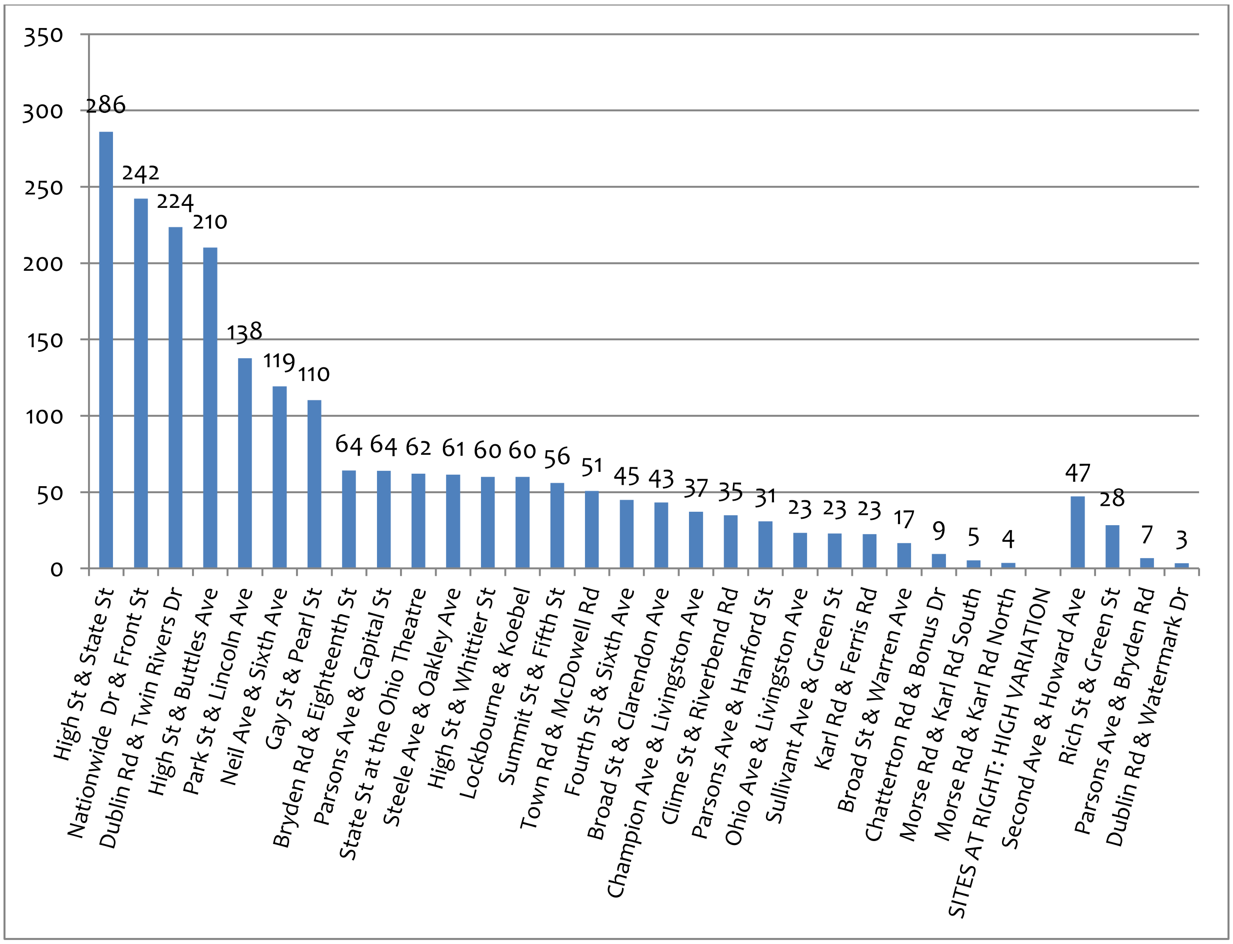


Figure 7: Average Daily Bicyclists (Monday-Sunday)

Day of Week Variation

The average weekday and weekend counts were 74 and 62 bicyclists per day, respectively. This indicates that on average, across all locations, the level of bicycling activity is somewhat higher on weekdays.

Locations with higher average weekday volumes in relation to weekend volumes are considered "commuter" routes, while "recreational" routes are those with the inverse relationship.

Figure 8 shows the percent difference between weekday and weekend counts, with negative values (displayed in blue) representing locations with commuting route patterns (i.e.-higher average counts on weekdays than on weekends). Values displayed in green illustrate locations with recreational riding patterns. Although there are some exceptions, in general, the downtown locations show a strong commuter bias. The commuter bias (average 51%) is higher than the recreational bias (average 20%) as illustrated by the length of the chart's blue bars as compared to the green bars.

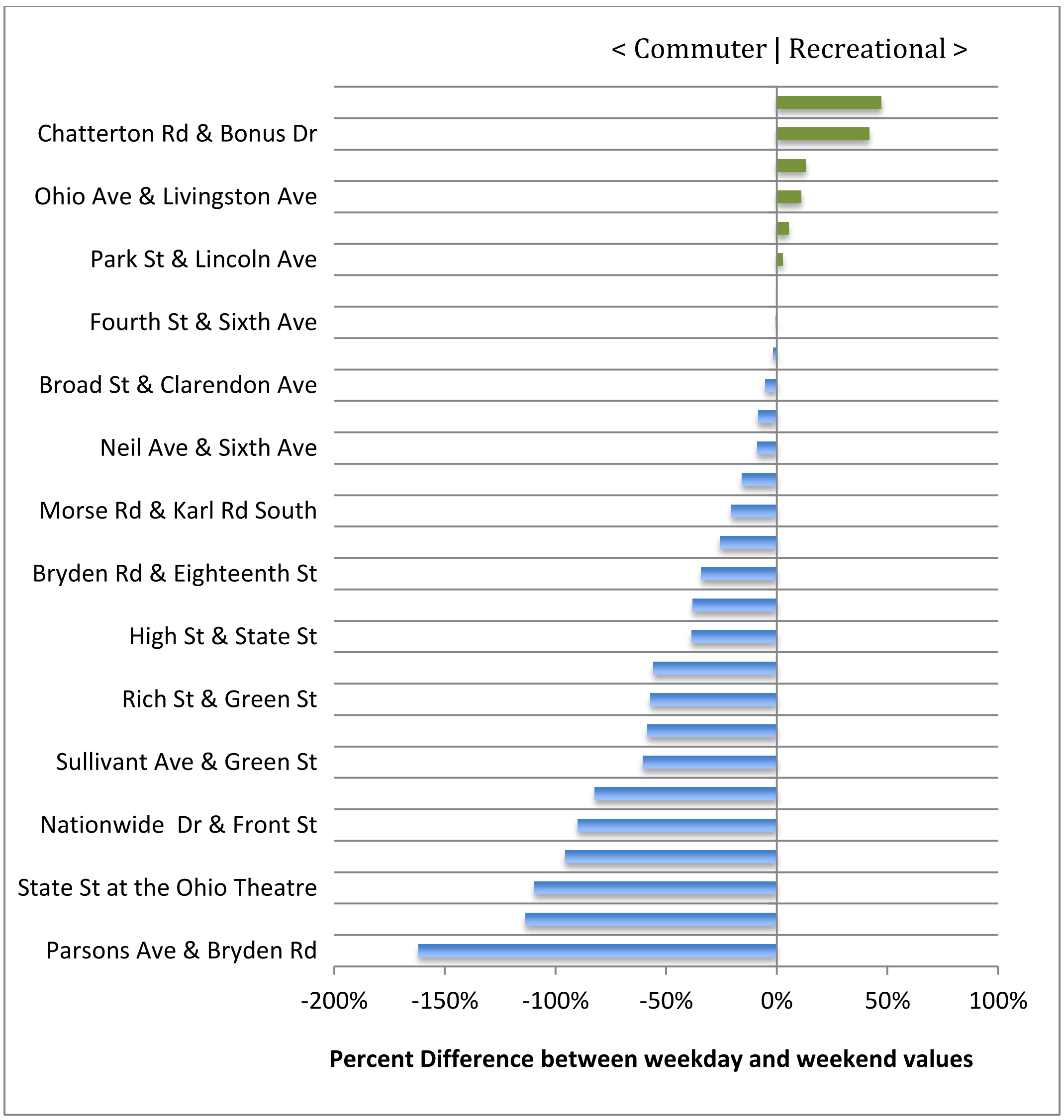


Figure 8: Bicycle Count Commuter Bias (negative values) Versus Recreation Bias (positive values)

4.2 Pedestrian Count Results

Busiest Locations

The average Monday to Sunday average daily volume data for 17 locations is presented in Figure 9. As with the bicycle counts, the three locations with the highest recorded average daily volumes are downtown at Nationwide Boulevard, Gay Street, and 3rd Street. These three sites had total volumes exceeding the memory storage capacity of the counters. Note that the Lane Avenue & Neil Avenue count location has a high daily count due to a nearby football game with 108,000 people in attendance.

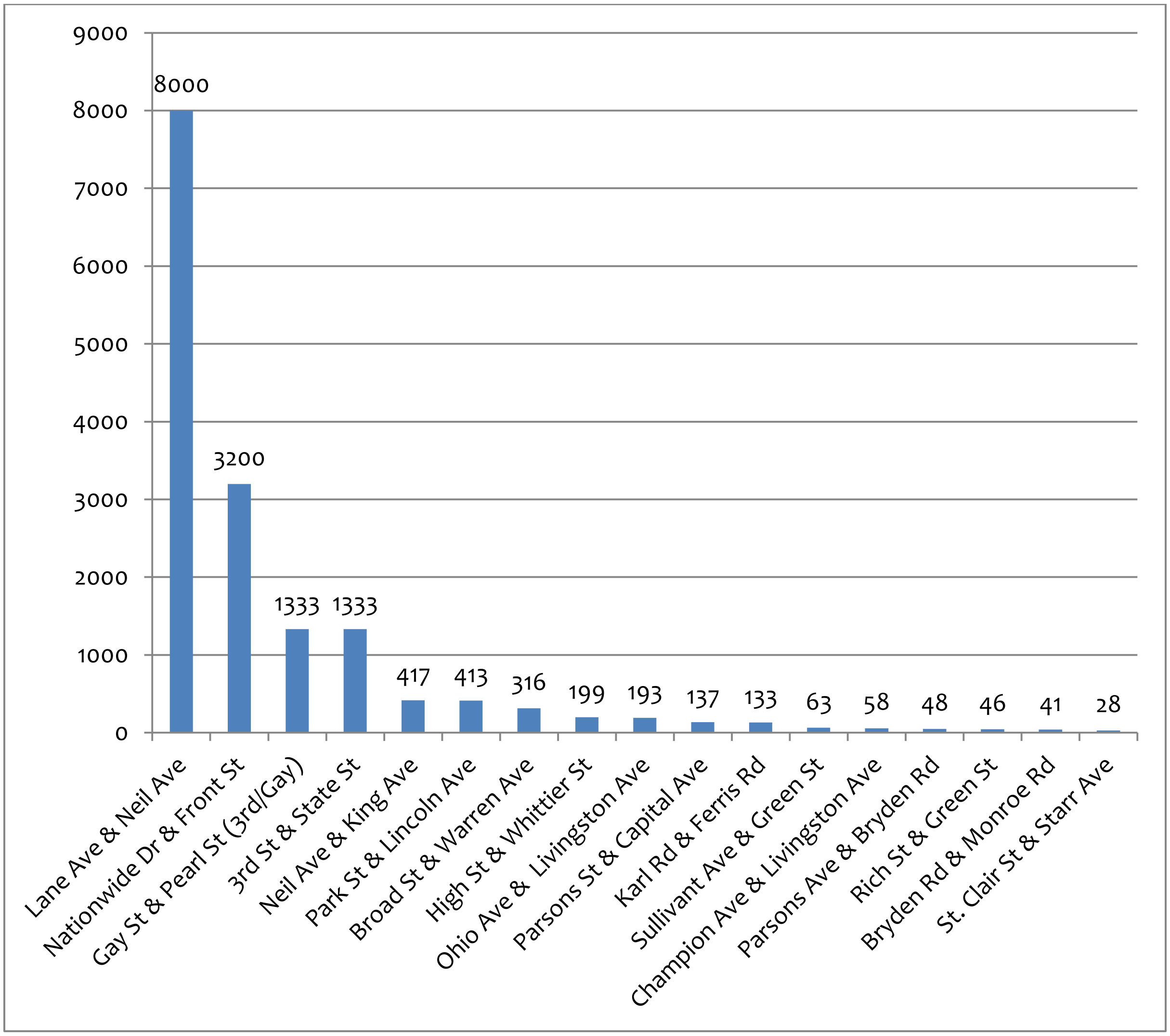


Figure 9: Average Daily Pedestrians (Monday to Sunday)

Day of the Week Variation

The average weekday and weekend counts were 481 and 242 pedestrians per day respectively. This indicates that on average, across all locations, the level of pedestrian activity on weekdays is double the level on weekends. This substantial difference in relation to the bicycle counts is reflective of the higher mode share for walking in the downtown area.

Locations with higher average weekday volumes in relation to weekend volumes are considered "commuter" routes, while "recreational" routes are those with the inverse relationship. Figure 10 shows the percent difference between weekday and weekend counts at the 17 locations, with negative values representing locations with higher average counts on weekdays than on weekends. As with the bicycle counts, the downtown locations show a strong commuter bias. The commuter bias (average 80%) is higher than the recreational bias (average 30%) as illustrated by the length of the chart's blue bars as compared to the green bars.

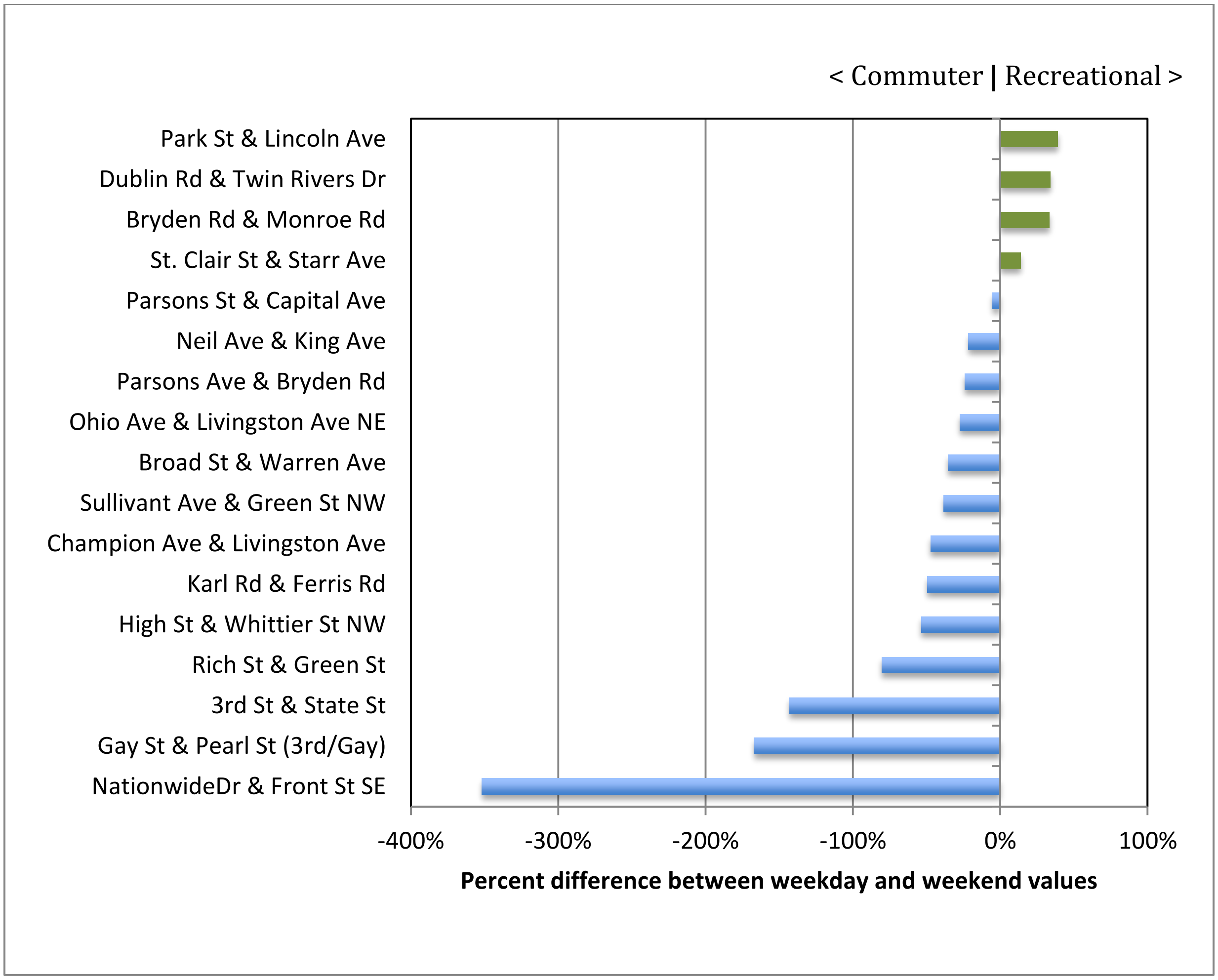
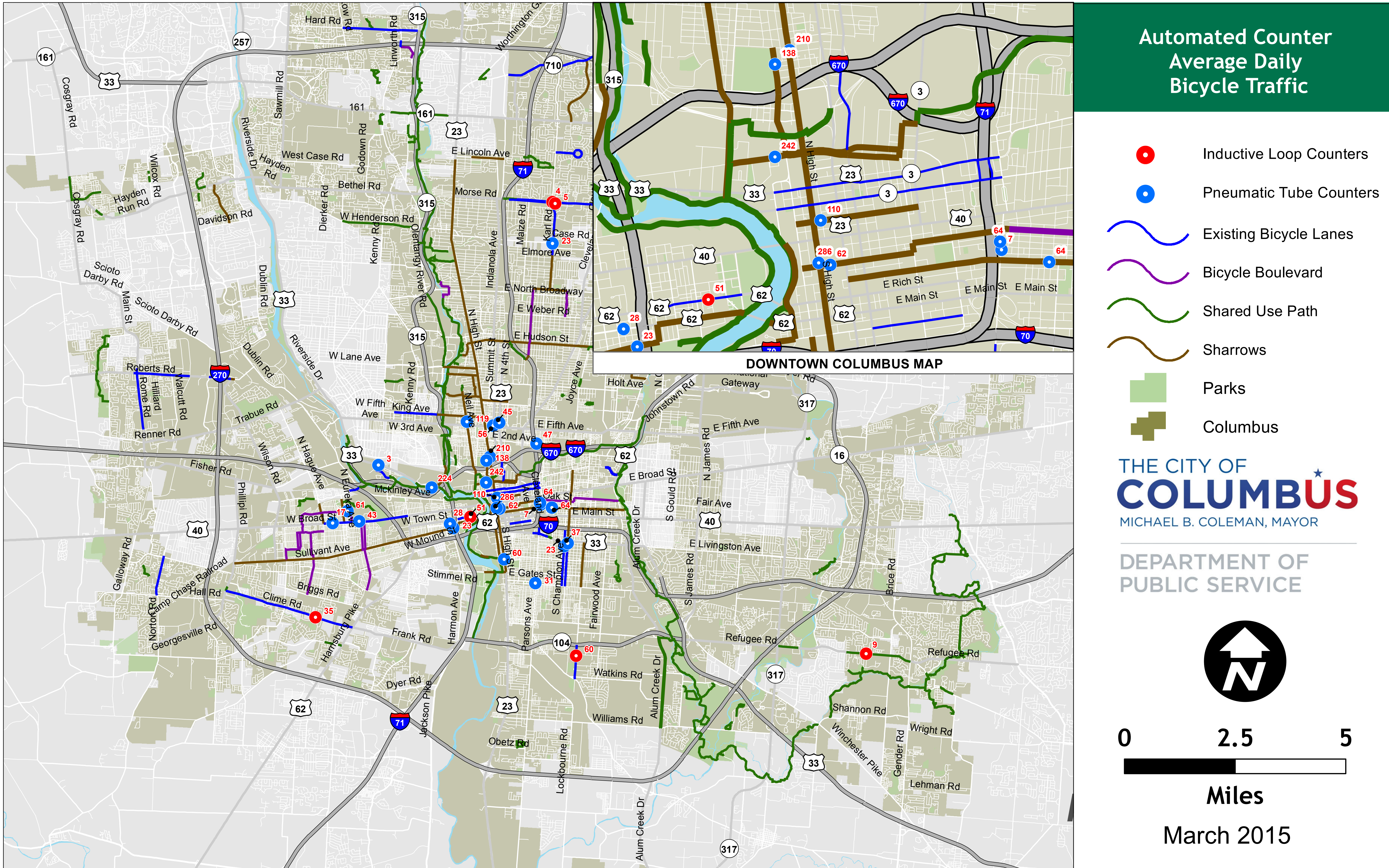


Figure 10: Pedestrian Count Commuter Bias (negative values) Versus Recreation Bias (positive values)

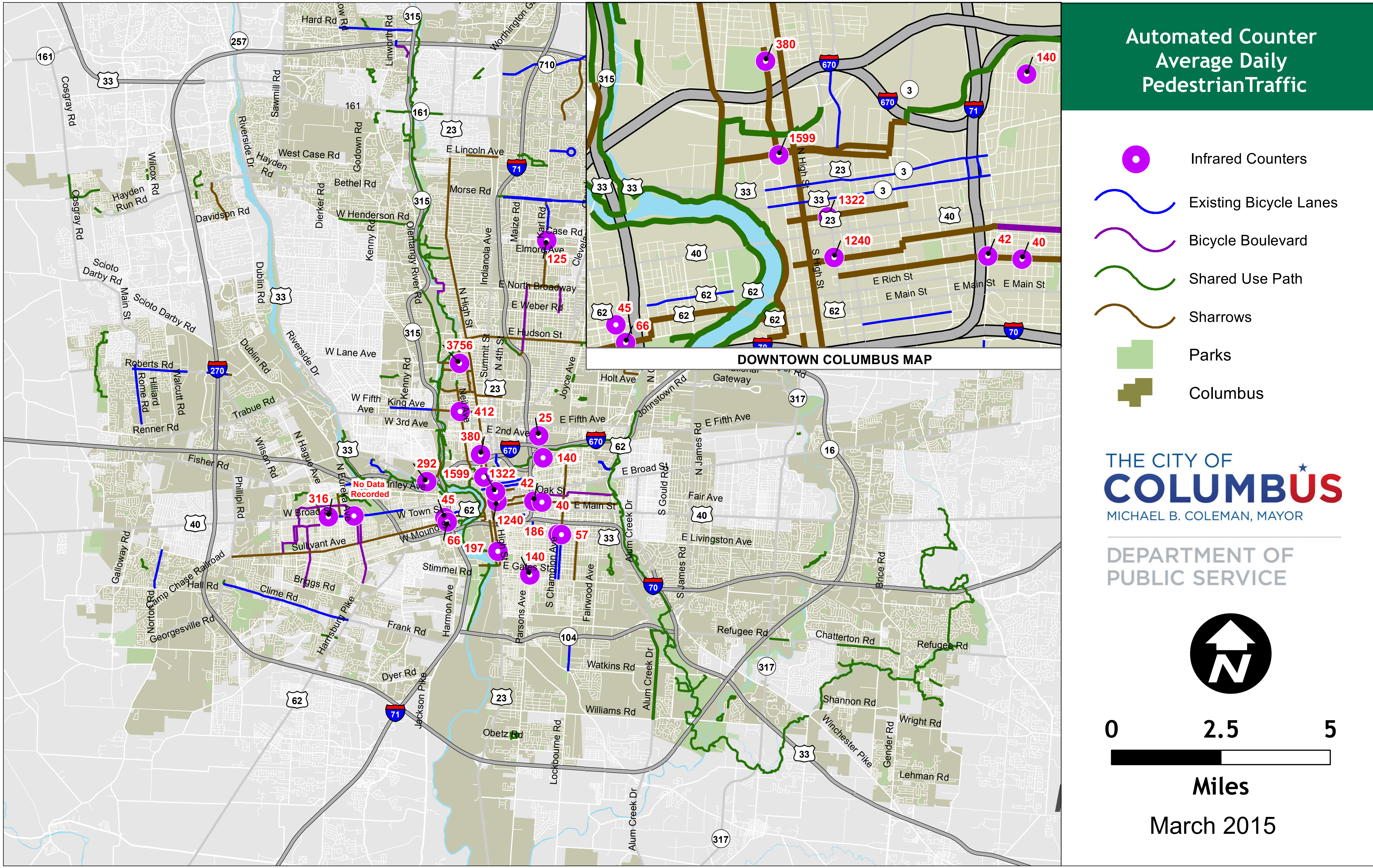
Appendix A: Results Map

The maps on the following pages show the bicycle and pedestrian count results according to location.



Data: City of Columbus, Franklin County, Mid-Ohio Regional Planning Commission, U.S. Census.

City of Columbus constructs and maintains bikeways within city boundaries.
Bikeways outside of city boundaries are the responsibility of the jurisdiction through which they run.



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